

Should Teeth Be Extracted Immediately in the Presence of Acute Infection?

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KEYWORDS

• Tooth extraction • Infection • Pericoronitis • Third molar

One of the oldest controversial topics in the field of oral and maxillofacial surgery is whether or not to extract teeth immediately in the setting of acute infection. Many dentists and physicians still believe that extraction of teeth in the presence of an acute infection may cause the bacteria to seed into the fascial spaces and cause life-threatening infection in the host.

Although the literature on this topic is dated, the purpose of this article is to review the literature and provide the clinician evidence-based recommendations on extraction of teeth in the setting of an acute infection.

The proponents of delayed extraction recommended postponing the extraction until the infection localizes and the inflammatory response subsides. A large part of this belief stemmed from reports in literature about patients developing severe life-threatening deep fascial space and central nervous system (CNS) infections, or septicemia after extraction of infected teeth. The controversy continued into recent times, with some investigators favoring resolution of infection before tooth removal and others favoring immediate extraction.

Frew,¹ in 1937, based on his personal clinical experience, cautioned against extraction of acutely infected teeth. Frew stated that wisdom teeth with pericoronitis should not be extracted immediately due to risk of inducing cellulitis and death.¹ He suggested that the overlying inflamed operculum provided a “habitat for microorganisms.” In his

opinion, “meddlesome operative interference” can result in osteomyelitis or cellulitis, resulting in a severe life-threatening infection. Instead, Frew recommended that the patient be placed on antibiotics and that palliative treatment (irrigation around the affected tooth, curettage, excision of the operculum, or removal of the opposing tooth) be performed and the tooth extracted at a later time once the inflammation resolved or the infection formed a walled-off abscess, which can be drained.²

Alternatively, Gluck,³ in 1939, from his clinical experience of approximately 600 patients, found that immediate tooth extraction in the face of acute infection is beneficial. Gluck stressed that immediate extraction avoids putting the patient through continual pain, decreased sleep, and decreased oral intake. Furthermore, removal of the offending tooth removed the source of the infection and provided a path for evacuation of pus through the extraction socket, resulting in faster resolution of the infection. None of his patients suffered from cellulitis or severe life-threatening infections postoperatively. Postoperatively, Gluck’s patients did, however, have a transient increase in swelling and trismus, which he attributed to the inflammatory effects of injection of local anesthetic. All his patients, had quick resolution of the infection and of all symptoms after the tooth was extracted.

Wainwright,⁴ in 1940, also supported immediate extraction from his clinical experience. He stressed that a necrotic tooth, devoid of blood supply and gangrenous pulp, acts as a “foreign body” and

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as a “culture medium” and should be removed as quickly as possible. Wainwright suggested that extraction of the tooth re-established the blood supply as well as provided drainage and relieved pain and pressure from the infection.

Haymaker,⁵ in 1945, presented a retrospective analysis of 28 cases of CNS infections after tooth extraction. These 28 cases were reported from a pool of 125,000 patients—again illustrating the rare occurrence of CNS infections from dental causes. The teeth were carious, symptomatic, infected, or impacted at the time of extraction. One case of subdural empyema, 12 cases of brain abscess, 2 cases of leptomeningitis, 1 case of encephalitis, 11 cases of cavernous sinus thrombosis, and 1 case of transverse myelitis were analyzed. Seventeen cases involved direct extension into the intracranial cavity and 11 cases involved hematogeneous spread. Lower posterior teeth were the major culprits and most likely to cause hematogeneous spread. Upper posterior teeth were more likely to cause direct spread of the infection. Staphylococcus was the most common organism identified in direct spread via fascial spaces. Direct spread usually resulted in osteomyelitis of the greater wing of the sphenoid bone, resulting in penetration into the cranial cavity. Streptococci were the major bacteria causing hematogeneous spread into the cranial cavity. Some infections ascended into the cranial cavity by the pterygoid plexus, resulting in cavernous sinus thrombosis.

Feldman,⁶ in his manual of exodontia in 1951, also supported immediate extraction based on his clinical experience. He suggested that incision and drainage of fluctuant lesions at the time of tooth extraction is also an important adjunct, resulting in quicker host recovery.

Hollin and colleagues,⁷ in 1967, reported 2 cases of brain abscess and 3 cases of subdural empyema in patients with dental infections. His work was a retrospective analysis of 5 cases of CNS infections of dental origin in a 25-year time period.⁷ Four patients had the symptoms develop after tooth extraction and one after restorative treatment of a carious tooth. The onset of symptoms varied from 4 days to 4 weeks after the procedures. The patients presented with symptoms, such as headaches, mental status changes, vision changes, convulsions, hemiparesis, or hemisensory deficits. All patients were febrile and presented with abnormal lumbar puncture findings. In 3 cases, the suppuration was “sterile.” In one case, *Micrococcus foetidus* was cultured. In the one other, *Streptococcus viridans* and *Haemophilus parainfluenzae* were cultured. Surgical débridement and antibiotics were used, but 3 patients

recovered and 2 died. In Hollin and colleagues’ analysis, posterior teeth are more likely to contribute to intracranial infection. They concluded that although intracranial complications were rare from dental procedures, the mortality rate is high and early recognition of intracranial infection is crucial to successful treatment and recovery. The concept of “sterile abscess” was prevalent decades ago when the isolation of anaerobic bacteria was difficult and uncommon.

In 1965, Kay presented his research into the nature of pericoronitis.⁸ The consideration of “predisposing factors” included upper respiratory tract infections, emotional upset, fatigue, and menstruation.

In his second publication, in 1966, Kay suggested that extraction of teeth in a setting of acute infection was safe.² In this article, based on the author’s thesis, Kay initially described the prevailing “standard treatment” for subacute pericoronitis, which included “warm saline irrigations of the pericoronal space,” “drying...of the area,” “insertion into the ‘pericoronal pouch’ of...50 percent trichloroacetic acid,” followed by neutralization of the acid with glycerin. Subsequently the patient was to use warm saline mouth rinses every 2 hours, “as hot as can be tolerated without scalding.” Kay stated that use of the acid “always ensures immediate pain relief.” When he substituted normal saline for the trichloroacetic acid for 152 patients, none noted rapid relief of the pain. Kay also discussed immediate extraction of the opposing tooth or, alternatively, reduction of its cusps. He thought that this would immediately reduce the pain associated with pericoronitis. In a “test series” of 106 patients for whom he withheld treatment of the opposing tooth, the treatment period was prolonged 5.5 days. When the infection was severe, Kay recommended penicillin, which was satisfactory for most patients. This was in the days before development of significant antibiotic resistance. Kay’s earlier article stated, “all cultures were sensitive to penicillin.”⁸

Kay performed a trial of 56 patients with “acute” severe pericoronitis, for whom he performed the “standard treatment” as for subacute conditions and 48 (86%) deteriorated significantly. The other 8 resolved without antibiotics but required multiple appointments for treatment, between 8 and 12 visits. Kay considered extraction of the third molar the final solution to pericoronitis but only after the “standard treatments” controlled the infection. The general opinion of the day was as follows. “There is common assent on the advisability of deferring extraction until the symptoms of acute infection have abated, to preclude the putative risk of osteomyelitis.”² His study (of 1781 patients)

also showed that the percentage of dry sockets was almost the same whether the teeth were removed immediately or delayed (even up to 10 weeks). Prior to this time, many thought that early extraction induced a high rate of dry socket.

Subsequently, Kay studied the effects of penicillin on the development of alveolar osteitis (AO).² He performed an initial pilot study, a retrospective analysis of 28 patients with pericoronitis for whom immediate extraction was performed. In this patient pool, 20 patients (71%) suffered from postoperative dry socket. In his analysis, the incidence of dry sockets was decreased by using preoperative antibiotics (penicillin G), given intramuscularly 0.5 hour before extraction. Only 2 (8%) of 25 patients treated in this way developed AO. In the same article Kay reported on his "main survey" of 2265 patients. His "control group" of 1341 patients with third molar extraction without antibiotics developed a 24% incidence of AO. A group of 301 patients treated with local anesthesia and a single preoperative dose of intramuscular penicillin developed AO 3.6% of the time. Another group of 623 patients treated under general anesthesia with preoperative antibiotics continued for 3 days and developed AO 2.6% of the time.

The opponents to this notion of resolution of infection before extraction recommend immediate extraction of the offending teeth, regardless of presence of infection, because it results in faster resolution of the infection, quicker recovery of the host, and prevention of potential mortality from these infections.

In 1951, Krogh⁹ performed a retrospective study of 3127 patients. Over a 5-year period, he extracted the infected teeth immediately.⁹ Typical signs and symptoms preoperatively were aching tooth, extraoral swelling, trismus, and pus in tooth socket. Extraction of teeth in his patients was performed despite any presence of comorbid conditions in the host. Incision and drainage as needed along with the tooth extraction were performed and drains were placed if necessary. The majority of these teeth (91%) were extracted using general anesthesia. Postoperatively, his complication rate was 3% (most of which were minor complications, such as dry socket and postoperative abscesses requiring incision and drainage). None of Krogh's patients developed osteomyelitis or septicemia. None of his patients died. His conclusion was that extraction of infected teeth, and of teeth with acute pericoronitis, as soon as possible results in fewer overall complications than in patients whose extractions were delayed.⁹ According to Krogh, by removing the tooth, the nidus of infection is eliminated from the host, preventing extension of the localized infection into the fascial spaces.

Hall and colleagues¹⁰ in 1968 evaluated the temporal relationship between the time of tooth extraction and the resolution of cellulitis in a randomized controlled prospective trial. A total of 350 patients with dental cellulitis were randomly assigned to 2 treatment groups. One group had their teeth extracted on day 1 versus the second group, who were placed on antibiotics and had delayed extraction of their teeth on day 4. The majority of the patients had the procedure performed under local anesthesia, but 6% of the patients required general anesthesia. Incision and drainage and/or systemic antibiotics were also given if deemed necessary by the clinician and the same criteria were used for both groups. The immediate extraction group had faster reduction of pain than the control group. Also the size of the swelling and the oral temperature of the patient also decreased more rapidly in the immediate extraction group. Patients in the delayed extraction group had twice the need for incision and drainage, which, if needed, was also twice as likely to be extraoral than intraoral. Neither group exhibited any intracranial or life-threatening complications. Hall and colleagues' study showed no ill effects or spread of the infection to deeper spaces from immediate extraction of infected teeth. Their conclusion was that immediate extraction of teeth is a safe and effective procedure.

Rud,¹¹ in 1970, performed a retrospective analysis of removal of 988 impacted lower third molars with acute pericoronitis from 1952 to 1967. A total of 94% of his patients had surgery under local anesthesia. The majority of these teeth with acute pericoronitis were partially impacted (85%) and penicillin was not used in majority of his patients (88%). Postoperatively, there were no instances of osteomyelitis, septicemia, cellulitis, or parapharyngeal abscess. Two percent of Rud's patients developed a postoperative abscess that required incision and drainage. His conclusion was that delay in extraction of teeth can result in septicemia or osteomyelitis and that early removal of infected third molars is prudent. He also concluded that the isolated case reports of systemic spread of infection resulting in death were likely caused by delay in tooth extraction rather than the extraction procedure itself. He further stressed that atraumatic surgical technique results in quicker host recovery. Furthermore, suturing an infected wound by primary closure postextraction is against surgical principles and should be avoided. Rud also stressed that when systemic symptoms are present, systemic antibiotics (penicillin) should be used. He also demonstrated in his study that local anesthetics in the setting of infection can be safely used and effective for removal of infected teeth.¹¹

Martis and Karakakis,¹² in a retrospective study published in 1975, extracted 1376 infected teeth; 327 of these teeth had pre-existing fascial space infections. No serious complications were recorded in this study. One patient had a mild postoperative osteomyelitis, which resolved with penicillin. The conclusion from this study was that infected teeth should be removed as quickly as possible, and that it is a safe procedure.

Martis and colleagues¹³ in 1978 published another retrospective study of 720 patients undergoing extraction of mandibular third molars with acute pericoronitis. Preoperatively, the patients had classic signs of an acute infection: pain (dolor), redness (rubor), swelling (tumor), warmth (calor), and trismus (functio laesa). Approximately 72% of these teeth were partially erupted. Five percent of the patients required general anesthesia, whereas the remainder had the extraction performed using local anesthesia. Nineteen percent of the patients required an incision and drainage of the odontogenic abscess at the same time as the tooth extraction. No sutures or local (intrasocket) antibiotics were used. Select patients with pre-existing fascial space infections were given systemic antibiotics postoperatively (either ampicillin or erythromycin). On postoperative follow-up, there were no serious outcomes, such as septicemia, cavernous sinus thrombosis, brain abscesses, or osteomyelitis in this study. Postoperative fascial space infections developed in 1.67% of Martis and colleagues' patients (6 patients with buccal space, 5 patients with submandibular space, and 1 patient with parapharyngeal space). These required subsequent incision and drainage. The investigators attributed these complications to delayed surgical intervention rather than the surgical intervention itself. The conclusion was that extraction of acutely infected/abscessed teeth as early as possible prevents spread of infection into the fascial spaces and thus reduces patient discomfort.

According to the literature review on this topic, the earlier infected teeth are removed from the host, the more favorable the outcome. Furthermore, incision and drainage of a fluctuant abscess, if present at the time of surgery, results in rapid relief and resolution of the infection. Moreover, systemic antibiotics in a host with systemic spread of the infection are also an important adjunct to the overall care of patients. Finally, several investigators have shown in their clinical experience that the fear of spreading the infection or causing a life-threatening infection is unjustified and no true cause and effect relationship has been established.

There are, however, some relative indications to delay tooth extraction. Although none of these is an absolute contraindications, prudent clinicians

must keep them in mind before performing surgery. These include efficacy of the local anesthetic and comorbid medical conditions, such as diabetes or coagulopathies.

Optimization of a patient's medical condition results in more successful outcomes after major surgery. In minor dentoalveolar surgery, these medical considerations are relative, not absolute, indications for delaying tooth extraction. Nonetheless, it is still crucial to eliminate the source of the infection (ie, the offending tooth) as soon as possible.

In Krogh's article, he describes extracting teeth without delay even in his severely medically ill patients. In his retrospective study, there were no adverse outcomes of extracting infected teeth in patients who were medically ill.⁹ Moreover, in an immunocompromised patient, it may be prudent to remove the nidus of infection as soon as possible.

SUMMARY

As seen in this review of the topic, the controversy has been settled for several decades, yet the purpose of the article is to review the evidence on both sides of this question, because concerns arise from time to time, particularly from general dentists and physicians unfamiliar with the oral and maxillofacial surgery literature. The earliest literature—articles before the antibiotic era—considered immediate (at the time of initial diagnosis) extraction to be dangerous. These articles presented primarily the lowest level (level IV) evidence, expert opinion based on personal experience. Later articles suggesting that early extraction did not lead to serious infection or to CNS spread also had lower levels of evidence (level III), retrospective uncontrolled case series. Only the article by Hall and colleagues¹⁰ provided strong evidence (level Ib) in the form of a prospective randomized controlled trial, finding that delaying extraction led to more severe infection, which required more extensive surgery. Currently, most surgeons understand that a combination of surgical extraction and antibiotics can be curative and that watchful waiting, even with antibiotics, is no longer acceptable.

Based on this review of the literature, the recommendation is to extract infected teeth as soon as safely possible, given a patient's overall medical condition. The longer a necrotic tooth remains, the more likely it is to cause a fascial space infection, with greater morbidity and possible mortality. Early extraction, along with incision and drainage, and antibiotics as indicated, hastens recovery. Reports of serious CNS spread of infection after tooth extraction are rare, and a causal relationship

between extraction and spread of infection has not been established. Therefore, the belief that extracting infected teeth may cause life-threatening infection is unsubstantiated.

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